

Osemelu (Ossie) Airewele | 26th January 2024

City as Builder: The Role of Architecture and Design

An Intersectional Perspective

BDP.
Quadrangle



“There is no more effective way to rein in inflation than to expand the supply of affordable housing and increase housing affordability,”

**Mark Zandi – Chief Economist,
Moody’s Analytics**



We Need a “Tin Lizzie” Re-Boot

The Ford Model T is an automobile that was produced by Ford Motor Company between 1908 and 1927. It is generally regarded as the first **mass-affordable** automobile.

The relatively low price was mostly the result of Ford’s efficient fabrication, including assembly line production instead of individual handcrafting.

The savings in the economies of scale of **mass production** allowed the price to decline from \$780 in 1910 to \$290 in 1924.

The Model T was colloquially known as the “**Tin Lizzie**”



How can the “Tin Lizzie” Revolution Apply to Building Homes?

The lessons we can learn from the “Tin Lizzie” revolution is to have a strategy to deploy housing, at scale on a clearly defined pipeline of sites.

Adopt a manufacturing mindset, based on a Design for Manufacture and Assembly (DfMA) “kit of parts” approach to design and construction. Once the machine gets going, it shouldn’t stop to realize value.

Remove any obstructions to the pipeline such as policy, planning, complete site appraisals and surveys, align the supply chain.

Consider targeted immigration to support the manufacture of homes – the skill base need is low when in a factory setting.



Design for Manufacture and Assembly (DfMA)



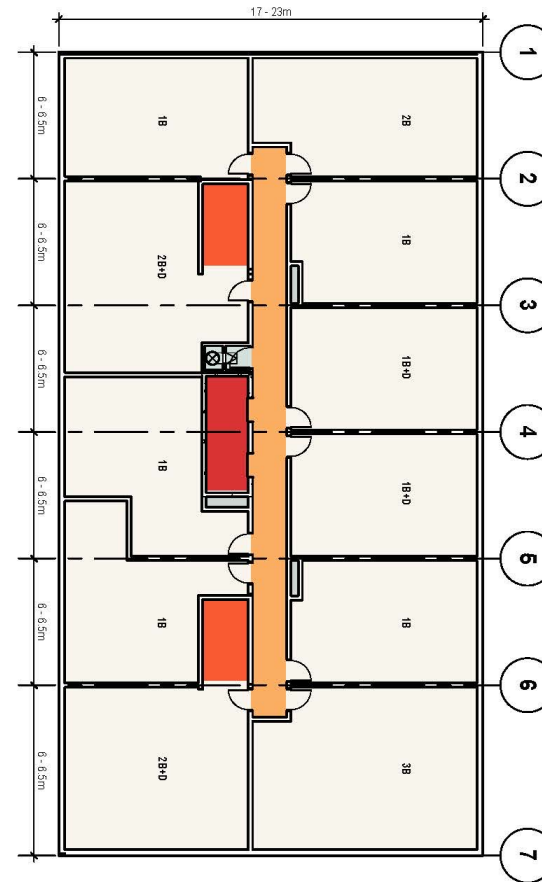
Design Concept Strategy | Typical Floor Plate

In a tight urban site; the typical approach to defining a floor plate is to work from the “outside to in”. The proposed site plan tells us that the floor plate should be +/- 20462mm wide by 38700mm deep. Based on the following key requirements:

A mix of 1 bed (50%), 2 bed (40%) and 3 bed (10%) suites at a minimum of 500 sq ft, 700 sq ft and 900 sq ft respectively.

A double loaded corridor.

Two elevators and two exits stairs.



Traditional Residential Planning

Design Concept Strategy | Typical Plan with Schematic Suite Layouts

Typical Suite Layouts








Overlaid on this typical floor plan are the minimum areas for kitchen, bedroom, living room and washrooms. The study illustrates two things:

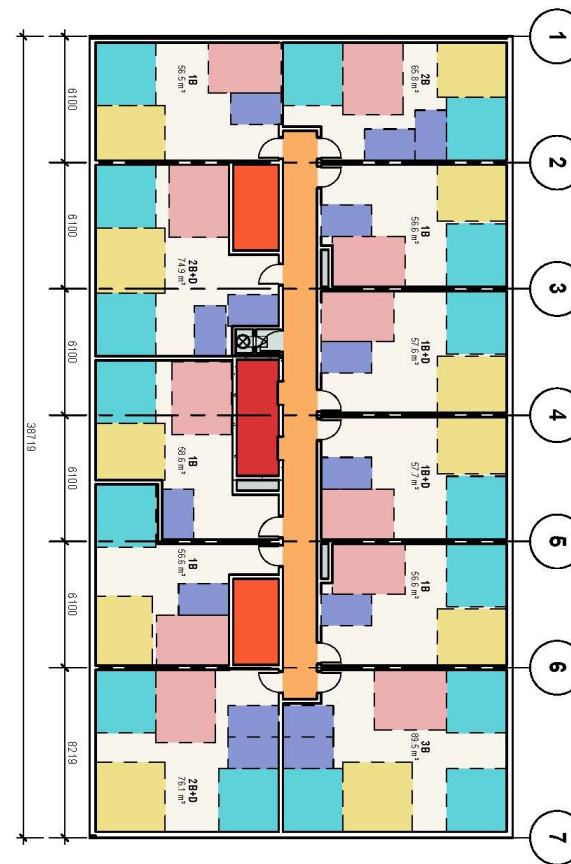
1. The configurations vary significantly from suite to suite creating multiple bespoke conditions for trades on site.
2. Inefficiencies can be seen through the gaps between the kitchen, bedroom, living room and washroom.

With the modular approach, cognizance of the transport and repeatable elements is essential for speed and economy. This approach also allows for mass customization in a controlled environment for fabrication.

To achieve this, an “inside to out” approach is essential. From the room types, to the suite, to the floor plate.

LEGEND

	Kitchen
	Bedroom
	Living Room
	Washroom
	Corridor
	Exit Stair
	Elevator

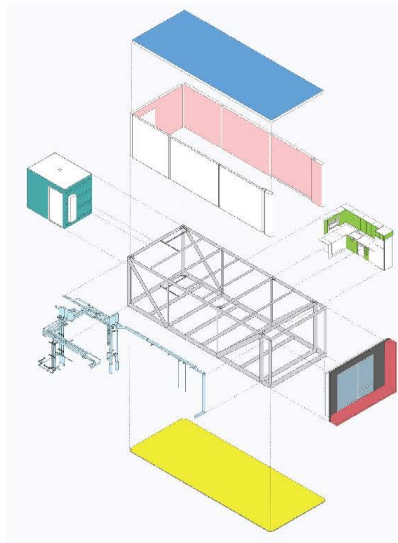
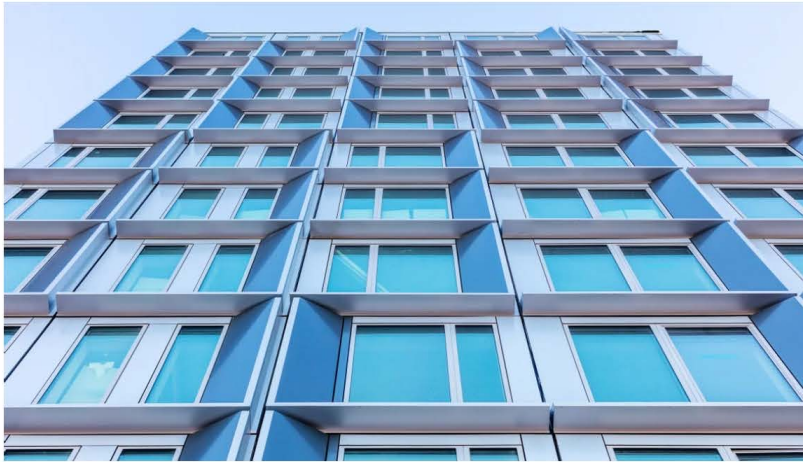


With a DfMA mindset, the approach is to think from the inside out, to find commonalities in elements of construction that can be achieved without compromising on how spaces should perform.

The application of this approach can be wide ranging, from affordable housing to leisure.



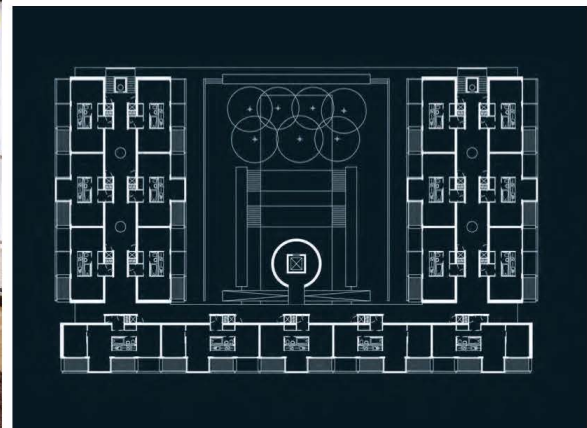
Modular Construction Case Study | 461 Dean Street, New York. US - Full Stack Modular - SHoP



Modular Construction Case Study | CitizenM Hotel, New York. US - Polcom Group - SBJ Group

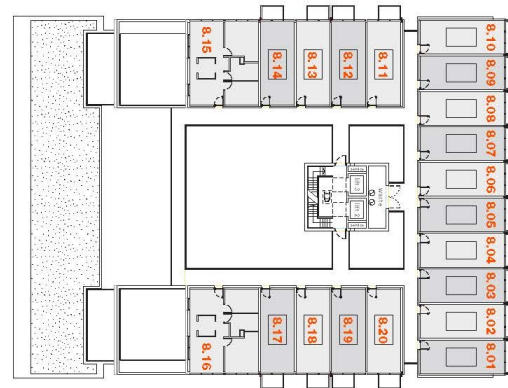


Modular Construction Case Study | MoHo, Manchester. UK - Yorkon Construction - ShedKM



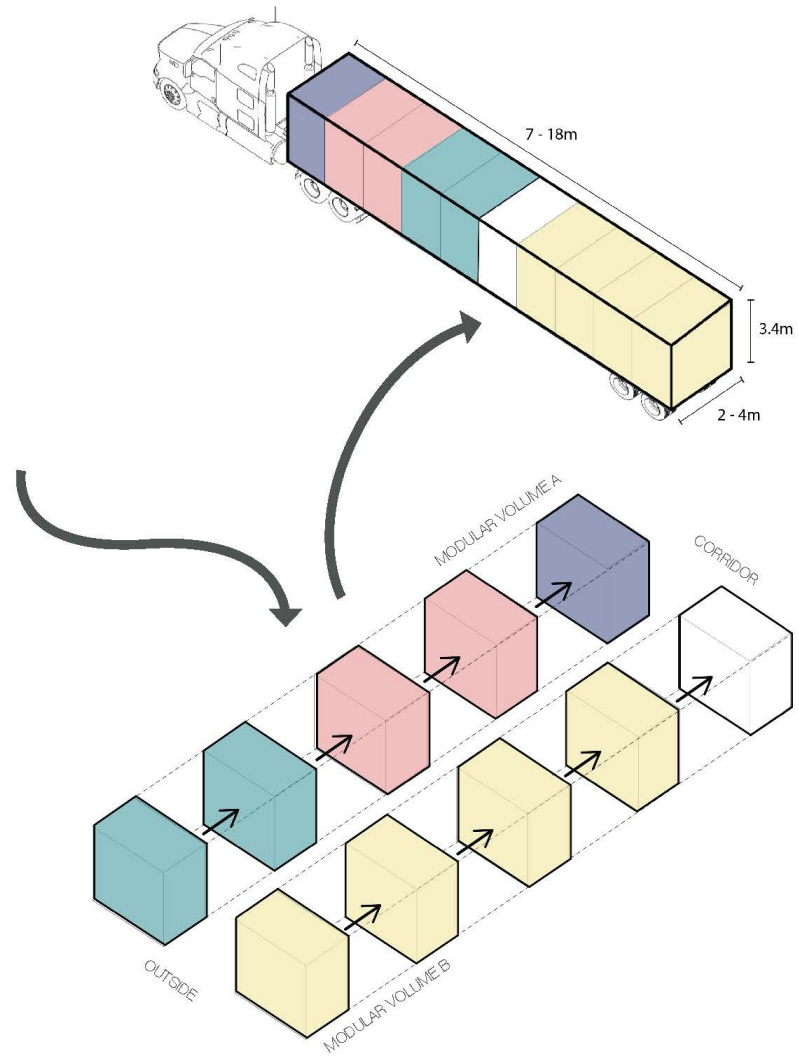
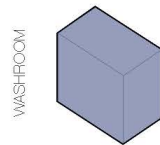
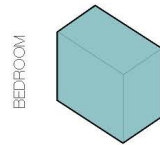
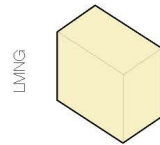
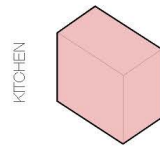
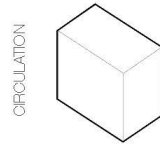
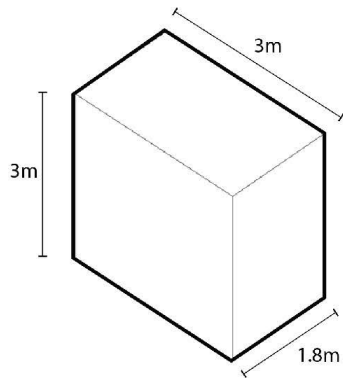
Modular Construction Case Study | ABITO Apartments, Manchester, UK - Carillion Building - BDP

.apartment views

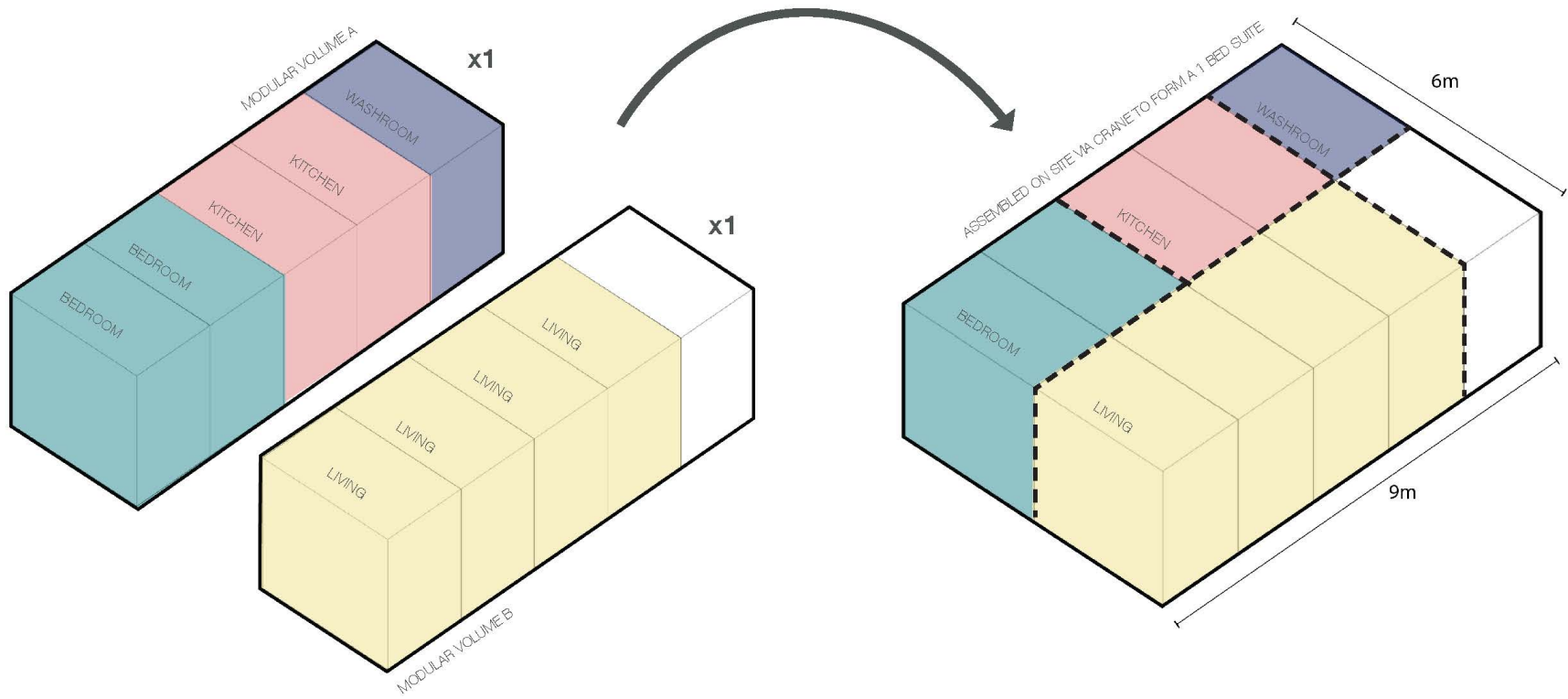


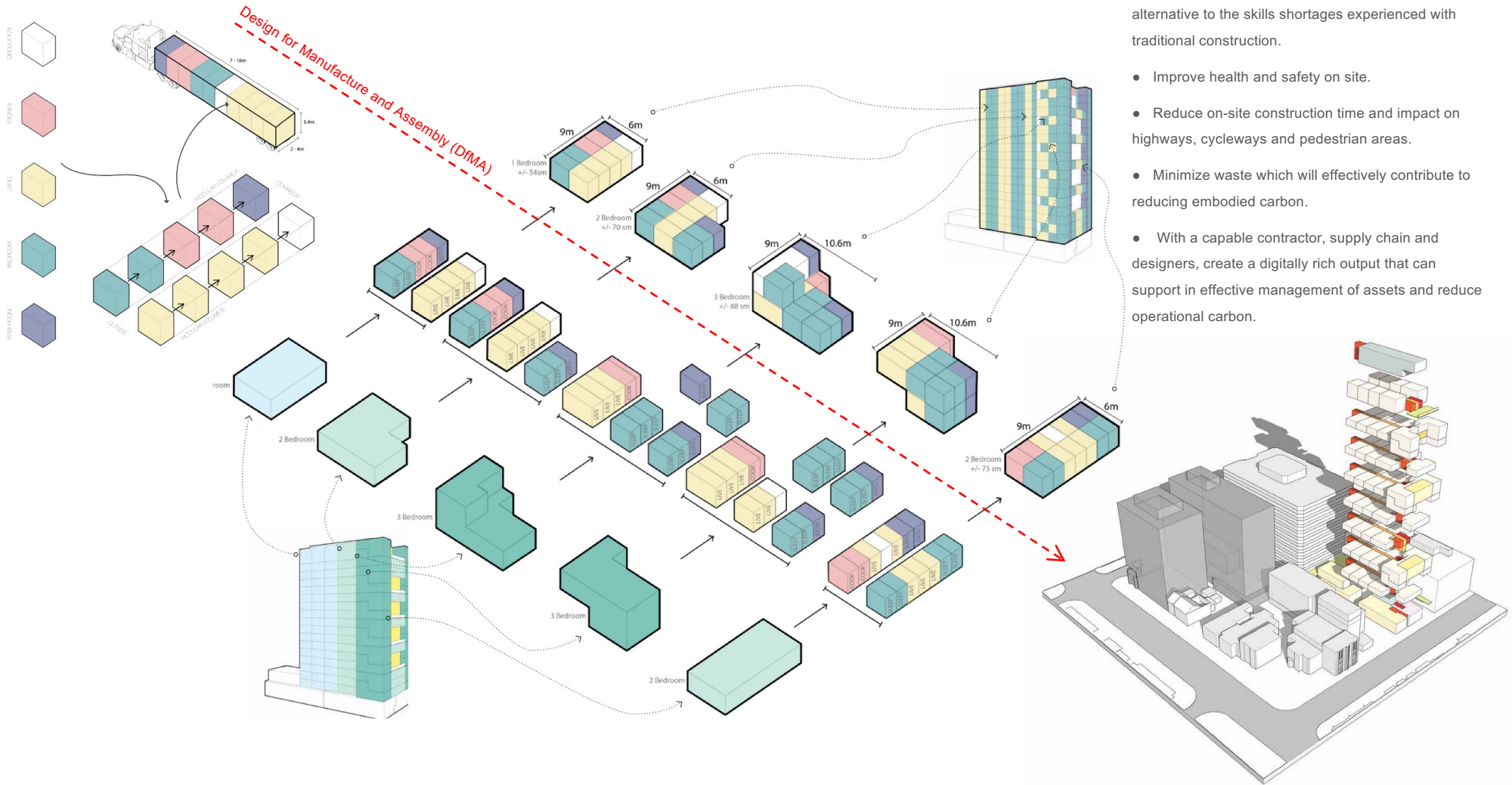
Design Concept | Modular Strategy

For the modular approach, we have started with the spaces that make up a suite. These spaces can also be further customized as a “kit of parts” which can be part assembled from corridor to external wall within a factory and transported to site as a modular volume. From which, the volume can be craned into position.



Design Concept | Modular Strategy



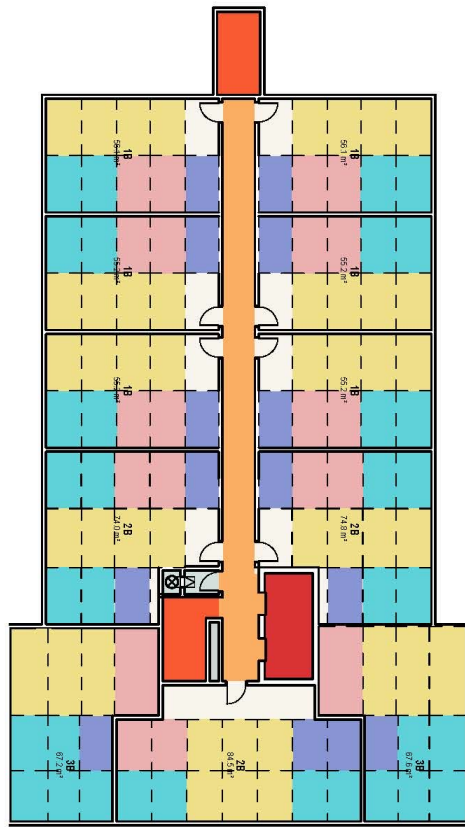


Design Concept | Modular Strategy

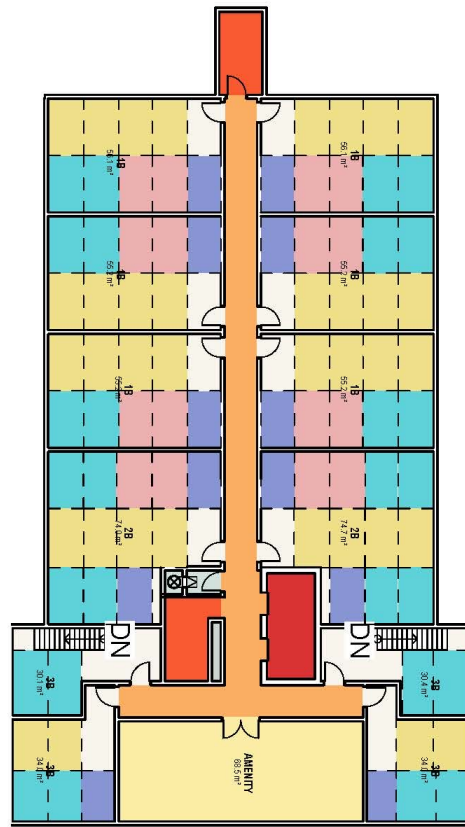
Suite Layouts

LEGEND

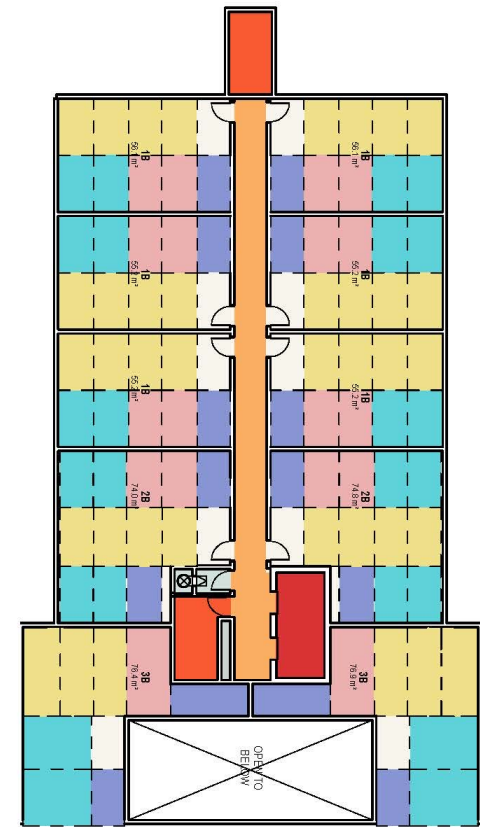
- Kitchen
- Bedroom
- Living Room
- Washroom
- Corridor
- Exit Stair
- Elevator



Floor A



Floor B



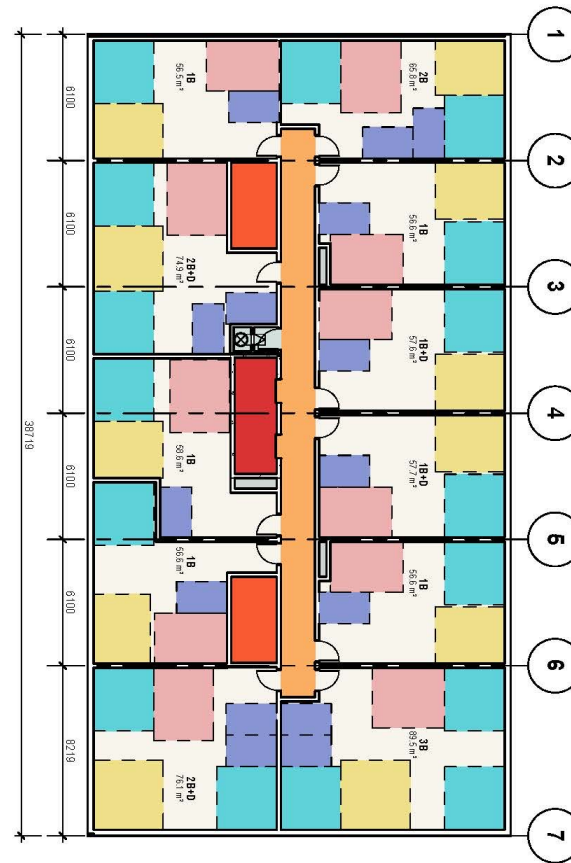
Floor C

Design Concept Strategy | Typical Plan with Schematic Suite Layouts

To circle back to the traditional approach, the efficiency in the layout of internal spaces with a DfMA approach is very clear.

LEGEND

- Kitchen
- Bedroom
- Living Room
- Washroom
- Corridor
- Exit Stair
- Elevator



Traditional Residential Planning

A Platform Approach

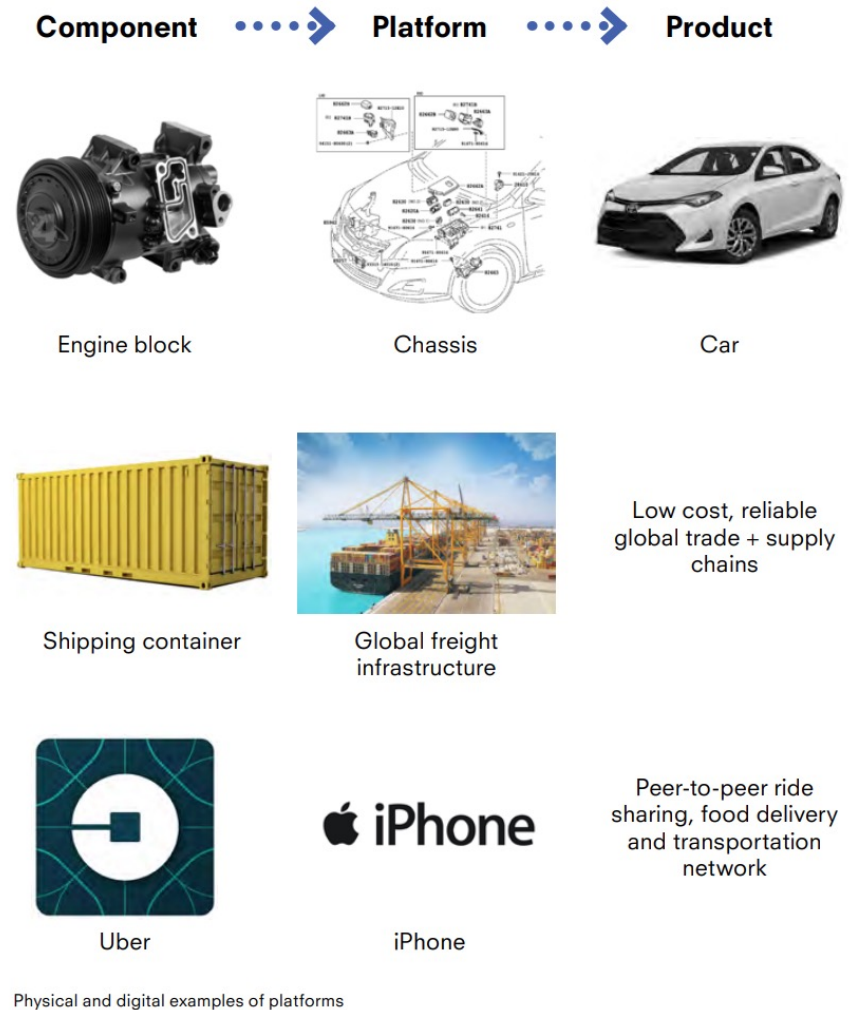


What is a Platform?

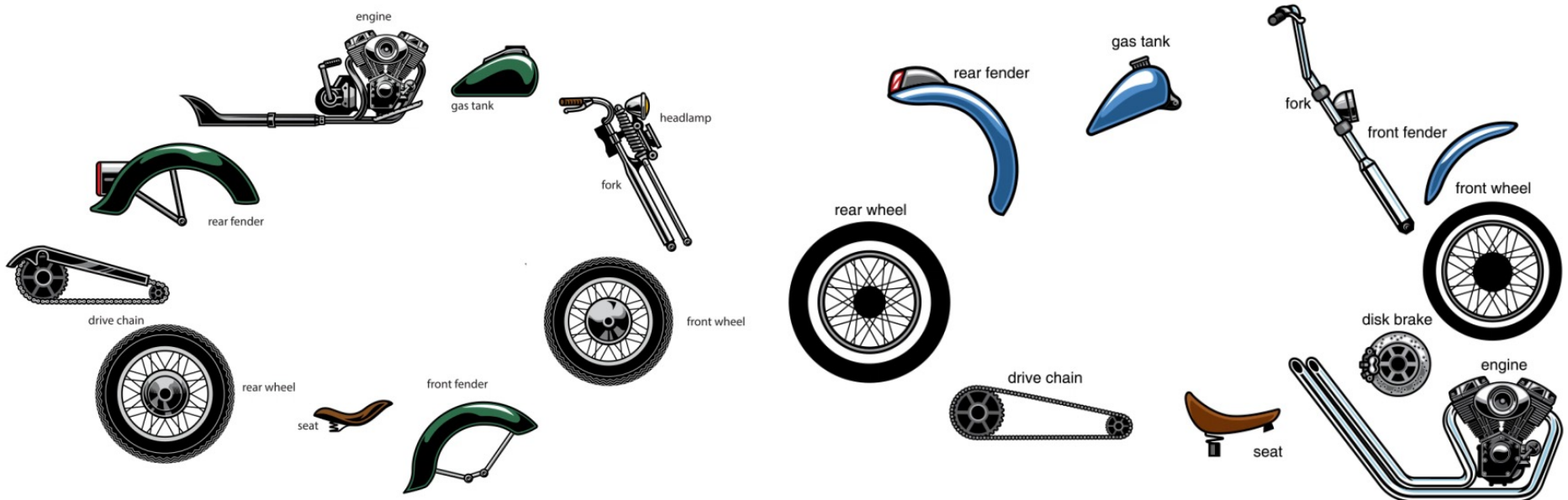
Platforms are sets of components that interact in very well-defined ways to allow a range of products and services to be produced. The term has been appropriated from the software and manufacturing industries, where systems based around platforms have both supported rapid innovation and formed a basis for exponential growth and value.

The diagram on the right shows familiar physical and digital examples. Industries that have adopted a platform-based approach have experienced the following benefits*:

- Bryden Wood



Platforms give you the opportunity to achieve Mass-Customization



This is achieved through the careful selection of components and platforms that can achieve the benefits of “economies of scale” through repetition but still create product outputs that are varied in look and feel whilst performing the same fundamental tasks they were created for.

COMMON REPEATABLE ELEMENTS

KIT OF PARTS
(COMPONENTS & INTERFACES)

PROCESSES

KNOWLEDGE

PEOPLE/
RELATIONSHIPS

The types of sub-systems and associated interfaces forming a product platform.

COMPLEMENTARY ELEMENTS

SET 1

SET 2

SET 3

The set of elements which combine with the product platform to create customised, derivative products.

The set of common repeatable elements and associated interfaces that form a common structure, from which a stream of derivative products can be efficiently developed and produced (sometimes in combination with complementary elements).

DERIVATIVE PRODUCTS

PRODUCT 1

PRODUCT 2

PRODUCT 3

PRODUCT 4

PRODUCT FAMILY

The set of individual products which share common repeatable elements and address related market applications.

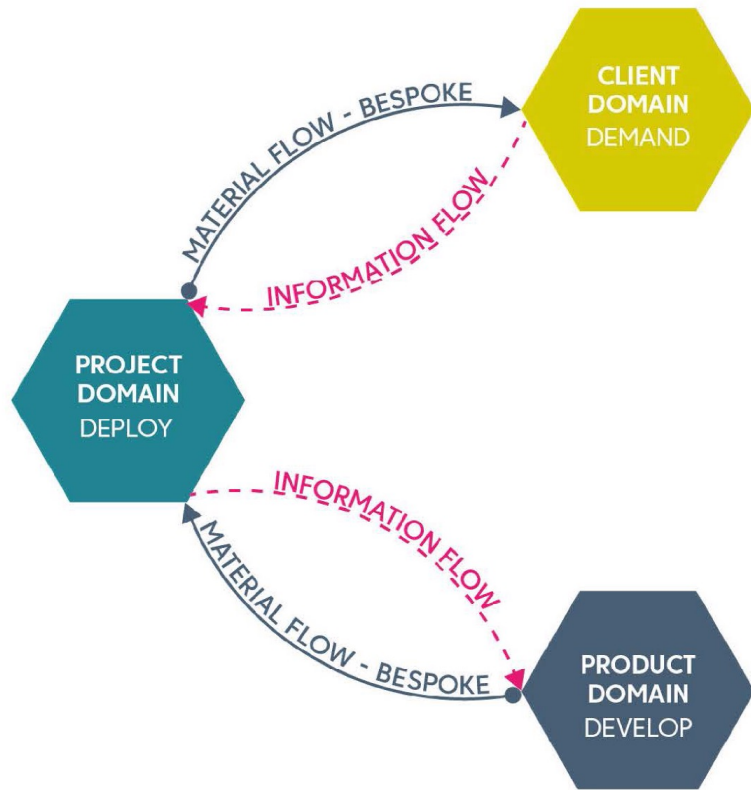
MARKET SEGMENTS

Categorisation of applications within a market grouped to be distinct between segments and common within them.

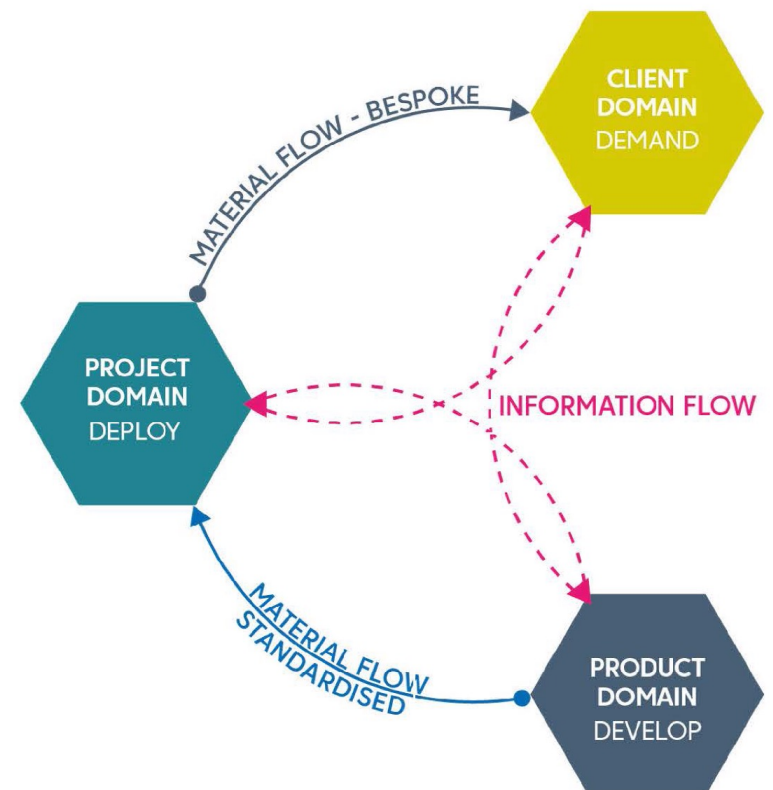
CONTINUOUS IMPROVEMENT LOOP

Adapted from 'The Power of Product Platforms' by Meyer and Lehnerd (1997).

Traditional Procurement



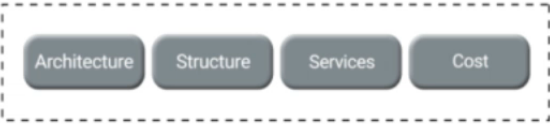
Platform Procurement



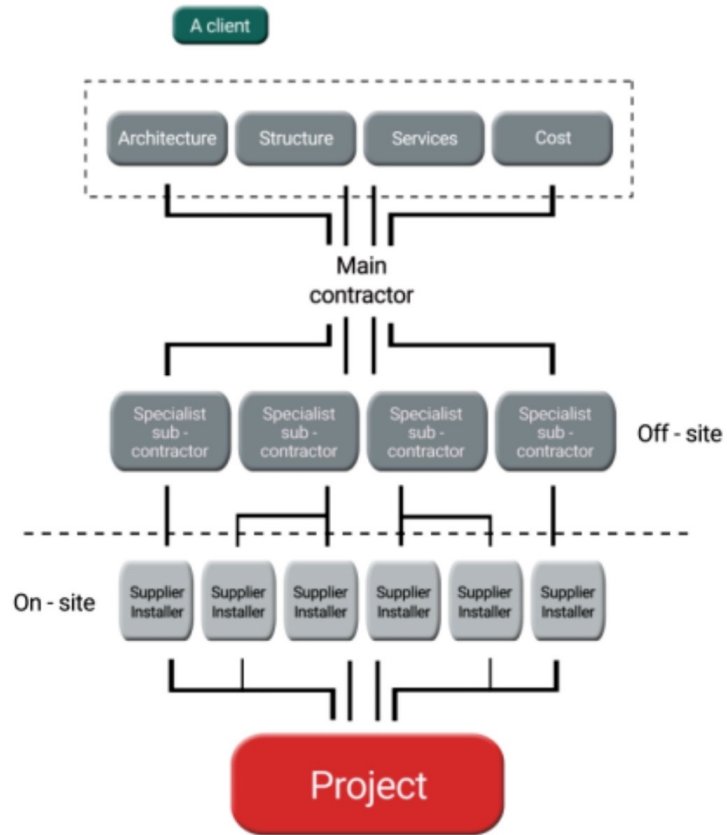
A platform approach allows for information flow in multiple directions between Client, Project and Product domains. This enables the opportunity for a “Virtuous Cycle” in the procurement of building homes on a massive scale, creating the ability to implement changes and adjustments in a manner that is more agile and reactive than traditional methods.

Traditional Design

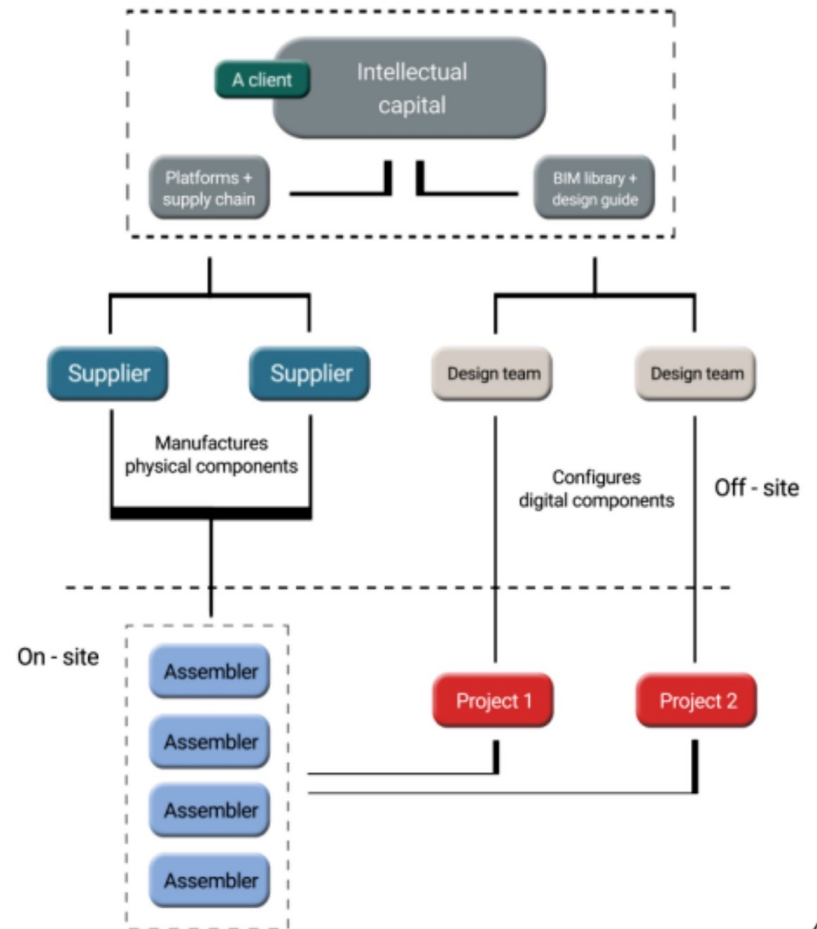
A client



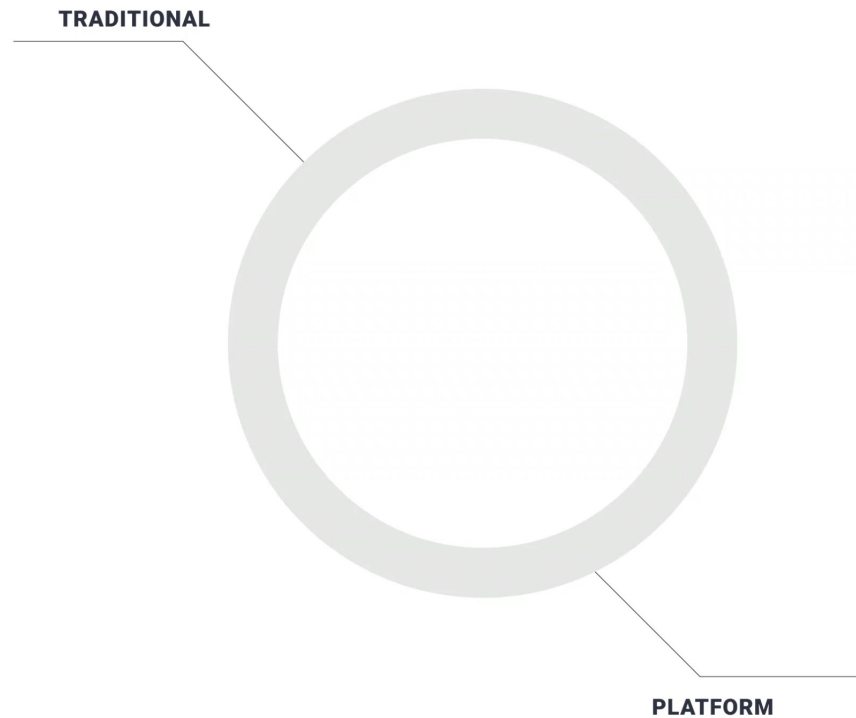
Traditional Design



Platform Design



A Summary of DfMA Benefits



- **Quality:** Deficiency list reduced to 65 - 75%
- **Labour:** Overall productivity improvement of 20%
- **Site Safety:** Working at height reduced to 40 – 50%
- **Waste:** Reduced to 70 – 90%
- **Speed:** 30 – 70% faster than traditional
- **Carbon Dioxide in Construction:** Reduced by 20 to 30% - particularly in transportation and waste
- **Cost:** 25 - 40% reduction (improve NPV), improved due to speed.

DfMA with BIM can Create a Predictive Approach to Asset Management

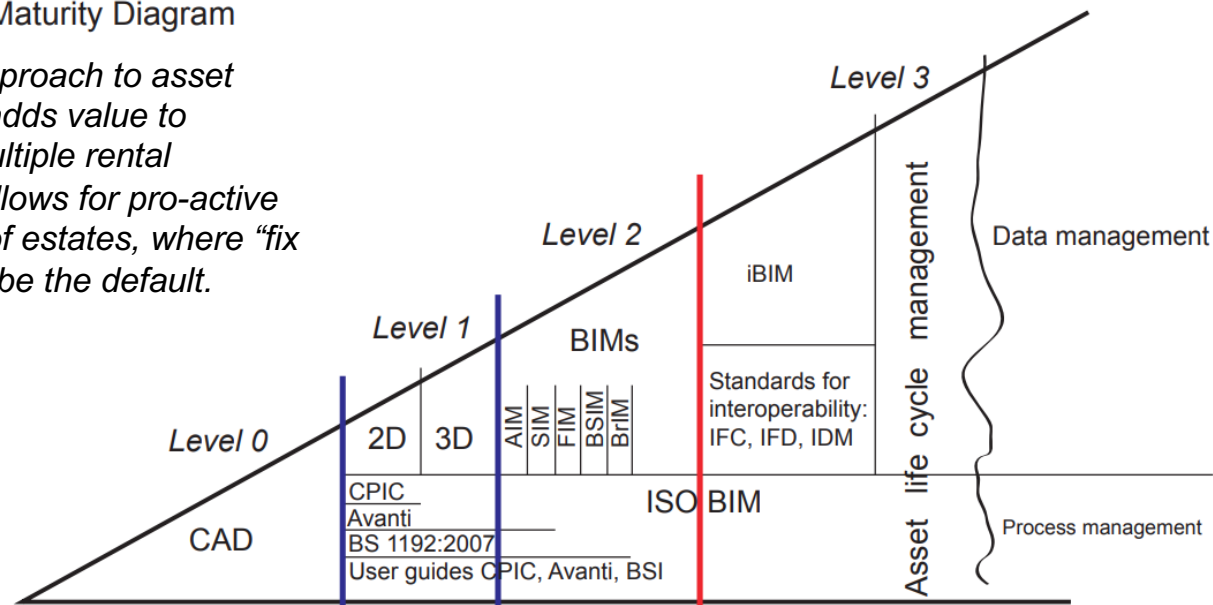
What is BIM?

Is widely used as an acronym for Building Information Modelling, it is defined as the Construction Project Information Committee as:

'...digital representation of physical and functional characteristics of a facility creating a shared knowledge resource for information about it forming a reliable basis for decisions during its life cycle, from earliest conception to demolition.'

Figure 1: BIM Maturity Diagram

A predictive approach to asset management adds value to maintaining multiple rental properties. It allows for pro-active management of estates, where "fix on fail" should be the default.



Source: Bew and Richards 2008



The Case for Mass Timber

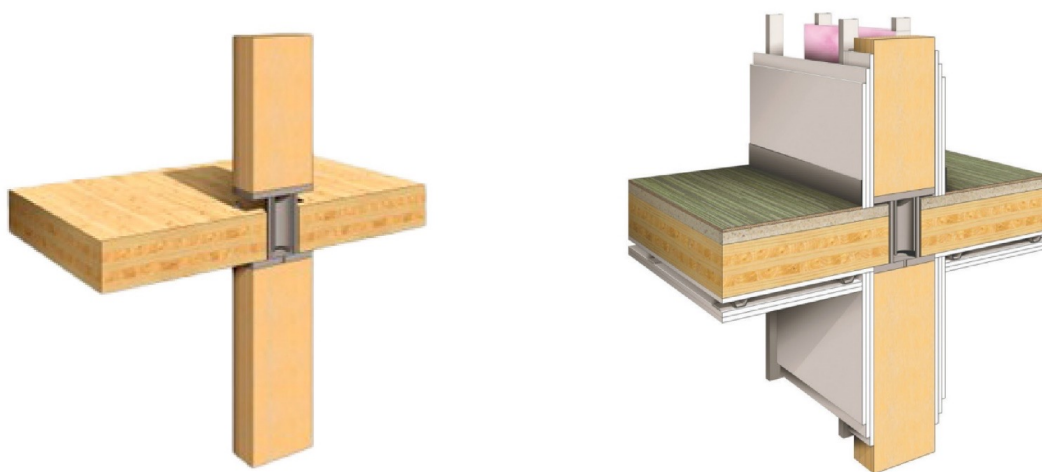


The Case for Mass Timber



□ 60_80 Atlantic

The Case for Mass Timber



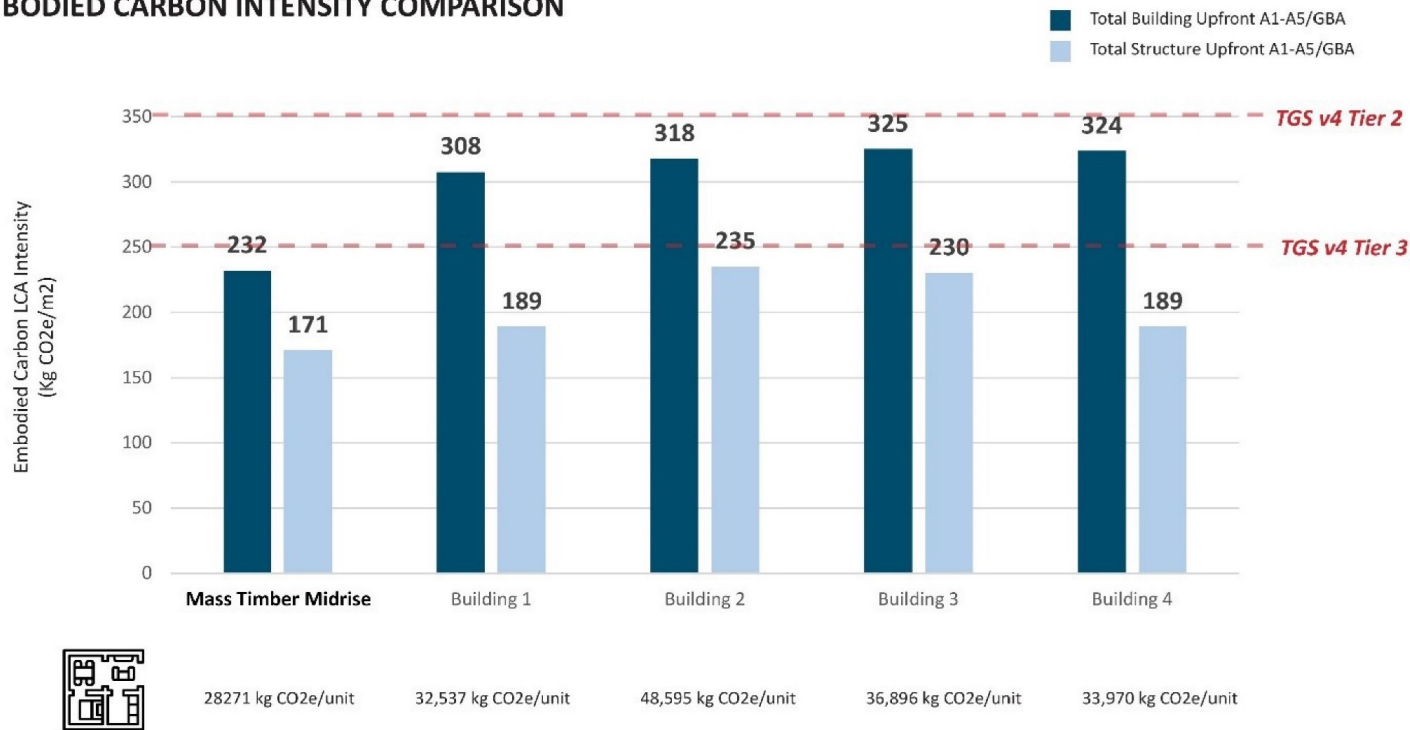
- OBC's 22 adoption of EMTC unlocks enormous potential for midrise development across Ontario.
- Some of the timber may remain exposed within the limits defined by OBC.
- OBC have deemed encapsulation as necessary to serve as a supplementary measure to enhance the inherent fire-resistive qualities of mass timber by providing added layers of protection.

Source: Canadian Wood Council and Acton Ostry Architects; [CS-BrockCommon.Study_23.lr.pdf \(cwc.ca\)](#)

□ Update to the Ontario Building Code (OBC) – Encapsulated Mass Timber (EMTC)

The Case for Mass Timber

EMBODIED CARBON INTENSITY COMPARISON



- Buildings 1 to 4 use traditional concrete and steel.
- Mass timber midrise puts us on a strong trajectory to significantly improve the Embodied Carbon LCA Intensity.
- In addition, mass timber is quick, light, quieter to install during construction with clear aesthetic appeal.

□ We don't need to sacrifice environmental performance

The Case for Mass Timber

① Densifying Transit Nodes



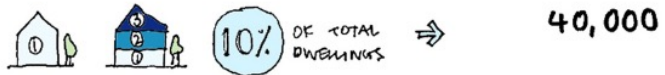
② Mid-rise Right of Way Guidelines



③ Downtown Tall Buildings Guidelines



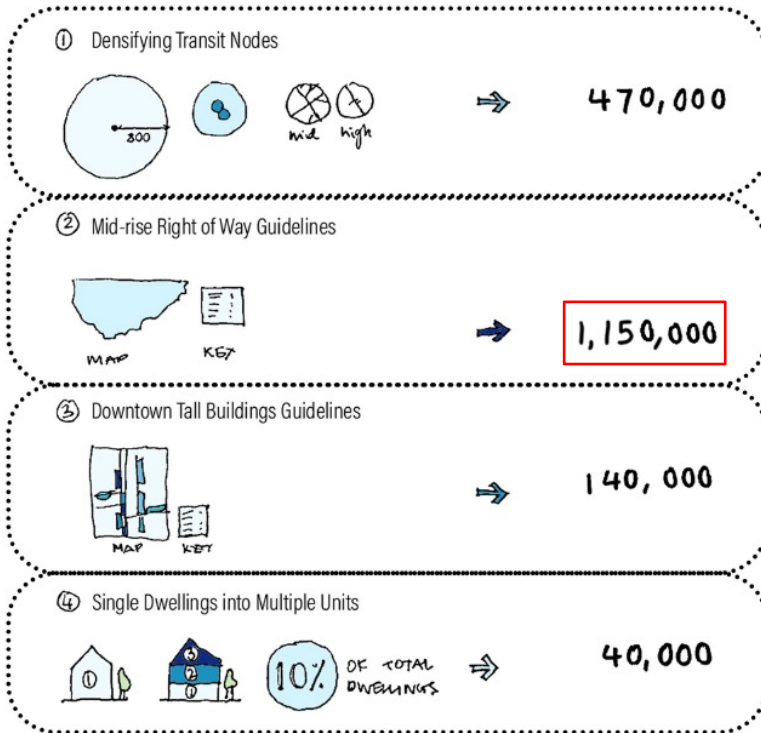
④ Single Dwellings into Multiple Units



1,800,000

The Mid-Rise Opportunity

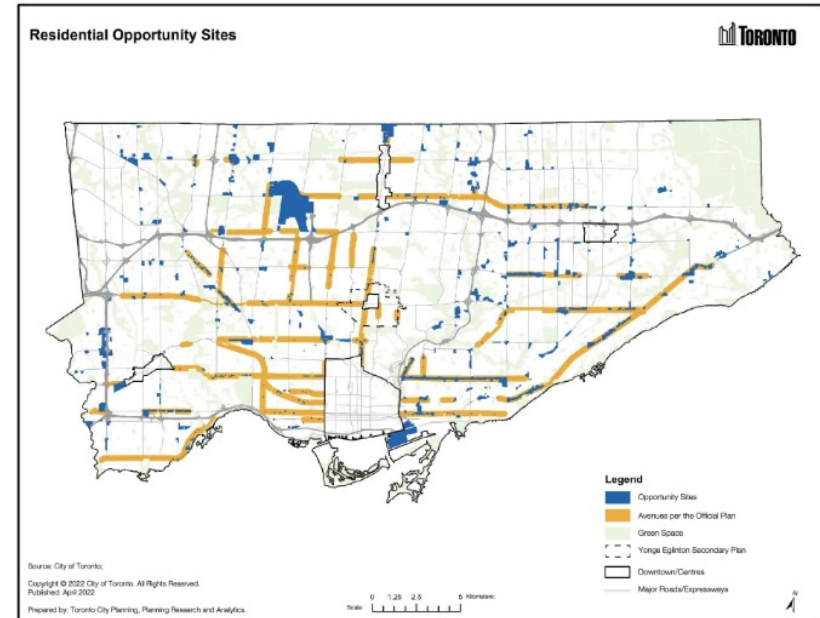
The Case for Mass Timber



1,800,000

The Mid-Rise Opportunity

In Toronto specifically, the *2023 Land Needs Assessment* for the City projects the potential for adding approximately **183,000 midrise units** along the Avenues and in various key areas such as Downtown, Midtown, Centres, and other promising locations throughout Toronto.



Source: *Our Plan Toronto: Land Needs Assessment*

The Case for Mass Timber



□ 2453 Bloor Street West – Leader Lane Developments and Windmill Development Group

The Case for Mass Timber



We should revisit the midrise guidelines and in making them as of right, we prioritize the ability to adopt the following three principles:

□ Jane and Bloor Street West – Leader Lane Developments and Windmill Development Group

The Case for Mass Timber



We should revisit the midrise guidelines and in making them as of right, we prioritize the ability to adopt the following three principles:

1. Sustainable technologies like Encapsulated Mass Timber Construction. EMTC

□ Jane and Bloor Street West – Leader Lane Developments and Windmill Development Group

The Case for Mass Timber



We should revisit the midrise guidelines and in making them as of right, we prioritize the ability to adopt the following three principles:

1. Sustainable technologies like Encapsulated Mass Timber Construction. EMTC
2. 12 stories or less to an area of 6,000 sm (a limit defined by Code using EMTC).

□ Jane and Bloor Street West – Leader Lane Developments and Windmill Development Group

The Case for Mass Timber



We should revisit the midrise guidelines and in making them as of right, we prioritize the ability to adopt the following three principles:

1. Sustainable technologies like Encapsulated Mass Timber Construction. EMTC
2. 12 stories or less to an area of 6,000 sm (a limit defined by Code using EMTC).
3. Based on a “kit of parts” approach embracing the benefits of Design for Manufacture and Assembly (DfMA).

□ Jane and Bloor Street West – Leader Lane Developments and Windmill Development Group

Quantity is important, but let's not forget about **Quality**

A response to Bill 23, More Homes Built Faster...



**WHAT DOES 1.5M
HOMES LOOK LIKE?**

Links to Resources and Work Cited

1 – [1.5M Homes | BDP Quadrangle](#)

2 – [More Homes - Faster: Using a Platform Approach to Design for Manufacture and Assembly to Reimagine How we Build Homes. \(bdpquadrangle.com\)](#)

3 – Construction Innovation Hub + UK Research and Innovation - [The Product Platform Rulebook](#)

4 – RIBA – [DfMA Overlay to the RIBA Plan of Work](#)

5 – Bryden Wood - [Delivery Platforms for Government Assets](#)

6 – Bryden Wood - [Bridging the gap between construction + manufacturing](#)

